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AUTHOR Valle, Ellen
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ABSTRACT

A working definition is proposed for "scientific text" in terms of text function, based on pragmatic criteria derived from various approaches to the sociology of science. The term "Language for Academic-Scientific Purposes" (LASP) is preferred because it allows for the inclusion of texts in the human sciences, at the same time implicitly excluding many "technical" texts that would be covered by the frequently applied concept of English for Science and Technology (EST). The definition and general assumptions of this paper are based on the concept of the scientific community as a self-contained and self-perpetuating group that needs to recruit new members from outside but that restricts access to its discourse to members of the group. A tentative discourse-oriented model is proposed for the analysis of LASP texts, which is then applied diachronically to two early scientific texts, one from 1665 and one from 1840. Contains 21 references. (LB)

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PRAGMALINGUISTIC FEATURES OF ACADEMIC-SCIENTIFIC DISCOURSE: A MODEL FOR ANALYSIS AND A DIACHRONIC APPLICATION

Ellen Valle
University of Turku

Introduction

General background

In recent years there has been increasing interest among applied linguists in scientific discourse and in the structure of scientific texts. (See eg. Lundquist, 1989; Malcolm, 1987; Nichols, 1988; Gunnarsson, in press.) At the same time, the structure of the scientific community, and the nature of scientific activity, have also been the target of growing attention in the social sciences, and the sociology and philosophy of science are rapidly growing disciplines. (See eg. Crane 1972; Mulkay 1977; Collins 1982; Latour and Woolgar 1982; Hull 1988.)

There is thus a considerable body of work by now on the structure of scientific discourse, but a definition of what constitutes a 'scientific text' is hardly ever given. Either it is assumed that the concept is intuitively self-evident (Nichols 1988, Lundquist 1989) and the characteristics of such texts are then discussed, or (in corpus studies) the label of 'scientific' or 'academic' is usually assigned by the corpus itself and is taken over without question or definition (eg. Biber and Finegan 1989). We need independent criteria of what constitutes such a text; furthermore, for purposes of contrastive analysis, they have to be applicable cross-culturally. Of course, a simple operational definition would be "any text published in a scientific journal"; but this begs more questions than it answers. In this paper, I propose a working definition in terms of *text function*, based on pragmatic criteria derived from various approaches to the sociology of science. I also prefer the term 'Language for Academic-Scientific Purposes', abbreviated LASP, or in this case EASP; this allows for the inclusion of texts in the human sciences, at the same time implicitly excluding many 'technical' texts which

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would be covered by the frequently applied concept of EST (English for Science and Technology; see eg. Sager, Dunkworth and McDonald 1980).

In this paper I first propose a tentative discourse-oriented model for the analysis of EASP texts; I then apply it diachronically to two early scientific texts.

Definition of an EASP text: a functional approach

In recent work in the sociology of science, the function of a scientific text is variously defined as a *contribution* to the ongoing debate, as a *turn in the exchange* (a journal article, the review of a book by another scientist, or a letter discussing another scientist's work); as an item in the *exchange of credit for support* (usually an article); or a token in the quest for *legitimation* (journal article, thesis, dissertation). All of these are based on the concept of the scientific community as a more or less self-contained and self-perpetuating group, which needs to recruit new members from outside but whose debate is restricted to members of the group (Crane 1972; Mulkay 1977; Macleod 1977; Barnes and Edge 1982; Hull 1988). It should be noted that book-length texts nowadays play a relatively minor role in this system, except in the humanities and to some extent the social sciences; books tend to be addressed to outsiders (popularizations of various level) or to potential recruits to the discipline (textbooks).
In terms of more specific pragmatic function, a text produced by a member of the scientific community may have one or more of the following functions (the term 'paradigm' is used relatively loosely, as equivalent to such concepts as 'model', 'theory' or perspective):

1) to contribute more or less raw observational findings within an existing theory or paradigm, without interpretation or discussion
2) to discuss or interpret these findings within an existing paradigm
3) to offer a reinterpretation of the paradigm so as to accommodate nonconforming findings
4) to decide between alternative paradigms
5) to offer a new paradigm, replacing one which can no longer accommodate the data.

These are obviously functions of increasing complexity and of increasing degree of controversiality, ie. polemicity. This will presumably be reflected in the text itself; I would anticipate a more or less direct association between increasing polemicity and the frequency of references to the 'activity' itself, ie. to science and to the work of scientists. I do not, however, deal further with this question in the present paper.

It should be noted that the classification *excludes* texts written for instructive purposes, such as textbooks, whose function is the indirect or direct recruiting of new members for the community, or reports and instructions to 'users' of scientific findings who are not themselves scientists. I think that the concept of the scientific text has to be restricted to texts written by members of the community and directed to other members. I further suggest (although I cannot at this point justify this on rigorously theoretical grounds) that texts with the lowest-level function, ie. the communication of findings without discussion (typically presented in a journal section called "Brief Notes" or the like), be excluded. A 'scientific text' can then usefully be defined as

a text written by an accredited member of the scientific community or a person seeking such accreditation, directed to other members of the community, and intended as a contribution to the scientific debate beyond the level of uninterpreted findings alone.

This definition, and the general assumptions underlying this paper, are based on the concept of the scientific community as a more or less self-contained and self-perpetuating group, which needs to recruit new members from outside, but access to whose discourse is restricted to members of the group. Similar restrictions hold true for most of the major institutions in society: familiar examples are the law, the army and the Church. In fact, it can be said that like these, science is an area where *felicity conditions* apply: a statement may be true uttered by anyone, but it only becomes 'science' when uttered by an accredited scientist.

Text type and text function

It is important to keep in mind that *text type*, which is often confused with text function, is an entirely different concept, and is defined on text-internal grounds. It is clear that in different communicative situations, almost any text

type can be used for almost any text *function*. In terms of LST/LAP texts, a journal article will contain expository sections (*Material and methods*, in part *Results*), argumentative sections (*Introduction, Discussion, Conclusions*) and possibly instructive sections (*Conclusions*, possibly including suggestions or recommendations, for instance in a medical or engineering article, in general the applied sciences. The dominant text-type and rhetorical function, however, will always be *argumentative*. The scientific community, like other LSP communities, is by definition a community of equals, and it is with one's equals that one argues; both expository and instructive texts are directed from those who have knowledge to those who do not and who need it or want it outside the community; either downward as in textbooks, upward as in reports to superiors or 'horizontally' outward as in reports to clients or applied instructive texts addressed to users.

Most traditional text typologies are based on the communication model and divide texts into *sender-oriented, receiver-oriented* and *text- or subject-oriented*. Scientific texts are usually classified under the third, and are therefore seen as primarily informative and expository texts; there is increasing evidence, however, that they constitute an example of another type altogether, which may be more common than is commonly assumed; that of texts oriented on the one hand towards the *activity* which underlies or motivates the text (in this case scientific research), on the other towards the *discourse* group or community to which both the sender and the receiver belong, ie. here the discipline community as a whole or a particular network within it. For instance, Gunnarsson and her colleagues at Uppsala have shown a significant increase in the proportion of such reference over the last one hundred years in Swedish scientific texts (eg. Gunnarsson, in press). It is in this direction that I think research into the structure and characteristics can usefully be pursued.

Sociopragmatic and discoursal characteristics of EASP tests

General discourse characteristics: cumulativeness, cooperativeness and competitiveness

If we look at science as an activity, and if we take into account (which I think we have to) that *publishing* (in the broadest sense - the "making public" of one's results and conclusions) is an essential part of the work of the scientist, not a

trivial follow-up to the 'actual' research in the laboratory or in the library, then the text itself can be seen as an expression - almost a metonym - of this activity; and it follows that a close examination of LASP text structure, if we choose our parameters carefully, can show us something about the structure of science itself. This discourse can be seen as characterized at the most abstract level by three types of feature: *cooperation*, *competition* and *cumulativeness*. These have all been discussed at great length in the history, sociology and philosophy of science. What I want to look at in the following is the actual forms taken by these in the text. In particular, I focus on the *cooperative and cumulative* character of science, which are in sociopragmatic terms perhaps its most salient features and which have contributed to the enormous power that science wields in the world today.

Mapping or transcription of discourse levels

Level 1. Pragmatic text categories

Cooperation	Specification of model/theory/methods Specification of degree of certainty / plausibility
Competition	knowledge-claims rebuttals
Cumulativeness	information structure of text (in particular, role and assignment of assumed / shared information

These 'macromarkers' can be mapped onto the next lower level of discourse, where we arrive at actual syntactic and morphosyntactic markers. Some of the most interesting ones are shown below, together with the area which they transcribe:

Level 2. Discourse text markers

Marker	Can be used for
Turn-taking	cooperation, cumulativeness
- reference to previous turns	(cumulativeness)
- offering of openings	
Stance markers	cooperation / competition
(primarily evidentiality)	
- self-oriented	
- other-oriented	
forms: hedges, modals, discourse verbs, etc.	
Indication of *status of knowledge*	all three
within community	
- established (ie. 'known' true)	
- controversial (ie. relevant)	
- rejected (ie. 'known' false)	
forms: verb tense; discourse verbs	
Indication of *status of information*	mainly cumulativeness
- thematic structure	
- focalization	
- entry of new participants	
- definite vs. indefinite	

These can in turn be mapped onto an even more specific level of microlinguistic structure. Taking just one, relatively simple subsystem, the *tense of the discourse verb*:

past	definitive knowledge; established interpretation rejected knowledge
perfect	findings / interpretations considered relevant to current debate; may or may not be controversial
present	current, ongoing work

The question of tense usage in scientific texts has been the subject of considerable interest in the recent literature (eg. Malcolm 1987; Hanania and Akhtar 1985). The findings seem to be partly contradictory or at least inconsistent. It should be stressed that the above model is a statistical rather than an absolute one, either descriptively or prescriptively; it describes certain probabilities or tendencies. Many counterexamples will be found; but I suggest

that if a text deviates too greatly from this model, it will be seen by the reader (and, more importantly in terms of 'gatekeeping' in the scientific community, by the referees) as ill-formed - not necessarily as a text in English, but as a *scientific text*, a text in EASP.

Turntaking and activity-related discourse markers

The cooperativeness and cumulativeness of scientific activity is linked with its character as an ongoing process of turntaking. It is no accident that an important element of scientific work, and one which practitioners generally find highly satisfying, consists of various meetings, conferences, congresses and seminars, where face-to-face communication can in fact take place. In an earlier paper (Valle 1987) I looked at the way in which papers read at scientific meetings seem to slide back and forth almost without noticing between items addressing or referring to the scientific community as a whole and those referring to the participants actually present at the meeting. These texts seem to be characterized by two categories of distinctive features. There are, first, those markers which identify them with this highly formalized form of *face-to-face discourse* - the constant (and more or less obligatory) *reference to previous turns*, the offering of *openings* for subsequent turns, the salience of *face-saving* (taking the form of hedging of all kinds, above all of plausibility and attribution shields), and the high incidence of *evidentiality stance markers* (cf. Biber and Finegan 1989), more particularly the pragmatic verbs used to specify commitment to both one's own findings and conclusions and those of others. Secondly, there are those which more directly reflect the aspect of cumulativeness; since these have been at least enumerated above, I shall not go into them further here. In the following discussion, I focus on what I consider the two most salient features of EASP discourse: those marking interpersonal, 'face-to-face' turntaking, and those expressing *activity-related discourse* in general.

Since, as we have seen, science is a highly cooperative and collective enterprise, taking place in a social context of research networks and groups of various size and level (see in particular Hull 1988), activity-related discourse markers tend at the same time to both refer to and themselves embody a process of turntaking, normally more typical of spoken than of written discourse. I have previously classified these markers into two parallel categories, each consisting

of four subcategories (Valle 1987); this classification holds true mainly for texts presented orally in face-to-face settings, where the turntaking aspect is most clearly visible, but can be adapted for purely written texts as well.

I. Items referring to the scientific community and its activities
   1. Items referring to the scientific paradigm or research model
   2. Items referring to concrete/specific research activities
   3. Expressions of the writer's/speaker's personal involvement, commitment or opinion; often but not necessarily involving
   4. Expressions of scientific courtesy or modesty (face-saving)

II. Items referring to the immediate discourse context (oral discussion, conference, workshop, etc.)
   1. Items referring to discourse context in general
   2. Items referring (by name or otherwise) to a particular participant in the discussion, other than the speaker him/herself
   3. Items referring to the speaker's own role or participation
   4. Expressions of the speaker's personal involvement, commitment, opinion or comment.

Activity-related markers

Activity-related markers include references to scientific theory-formation, models and paradigms; they may also refer to concrete research which has taken place, but without the specific reference by name, which is more appropriately included under turntaking models (see below). Such items often make reference to the cumulative nature of the discipline, sometimes but not always in evaluative terms. Some examples from Valle (1987):

(1) There is more or less unanimous agreement that depression is one of the most common forms of mental disturbance

(2) There is considerable controversy over the definition, diagnostics, epidemiology, course and treatment of depression.

(3) ... findings arrived at in a recent extensive epidemiological survey recently completed in Finland.

Turn-taking markers

Turn-taking markers include references to the work of other workers in the same discipline, usually in the form of a reference to a specific text (citation, following a particular convention - MLA, APA, etc.), or more generally to a body of work by another scientist, especially with a high status in the scientific community. Interestingly, turntaking in LASP texts (in both written and oral channels) also involves the *offering of openings for turns by others*, either inviting comment on one's work or suggesting possibilities of future research. Even more than general activity-related items, turntaking items tend to include evaluative markers. Examples abound: the following are from Latour and Woolgar (1982) and from Collins (1982), where the actual reference is given in an endnote and thus is not visible here.

(4) Our discussion of the demand for credible information contrasts with two influential models of the exchange system in science proposed by Hagstrom (1965) and Bourdieu (1975b). Both models have obviously been influenced by economics.

(5) Crane and others have missed the point that...

(6) It has of course been stated many times before (for instance in the work of Menzel) that scientists tend to claim...

Example (4) shows the interaction between the present speakers' turn and that referred to; example (6) shows interaction between general activity reference and turn-taking; and (4) and (5) show evaluative markers.

Diachronic analysis

The corpus

In the rest of this paper, I briefly outline some aspects of a diachronic, historical approach to EASP texts, and analyze two texts, dating from 1665 and 1840 respectively. This is a preliminary study to a more extensive examination of the occurrence of the discourse parameters discussed in the first three sections, in

a chronologically defined series of texts published in the *Philosophical Transactions of the Royal Society of London*. I have provisionally decided on a corpus which should hopefully give statistically meaningful results: sampling at fifty-year intervals, and taking all texts over a ten-year period in one particular field, physiology; 1661-70, 1711-20, 1761-70, 1811-20, 1861-70 and 1911-20. Towards the end of the period there may be too many texts, and a random sampling procedure would then be necessary. It is also interesting to look at the relative proportion of expository vs. argumentative texts; the early years of the Royal Society were (quite consciously) dominated by a Baconian concept of science, as the collection of raw data without a preconceived theoretical frame of reference or the formulation of hypotheses, and many of the texts seem to be of this type. It is also sometimes stated that science was originally, and up to the 19th century, seen as a more or less amateur hobby in which any educated 'gentleman' could take part. An approach based on text and discourse analysis, however, suggests that the text structure of even the earliest 17th century texts reflects the notion of a relatively closed 'scientific community', in which gentlemen 'philosophers' address each other, but exclude outsiders. It is merely a matter of how the group is defined.

Text type and text length

I have already commented on the gradual change in the corpus, from the 17th to the 19th century, from a predominantly expository text type to a predominantly argumentative one. This coincides with - and is presumably causally linked with - a change in the concept of science, from the Baconian to the Newtonian and/or Cartesian. What is interesting in terms of text linguistics is the simultaneous change in text length. Below are some figures showing this change, so far without significance analysis (see Table 1).

A closer examination of the texts shows a close correlation between text length and text type, where short texts ($x < 10$) tend to be expository in type and informative in function, long texts ($x > 20$) to be argumentative in type and polemical in function. In the intermediate size category ($10 < x < 20$) there is some fluctuation. Since text length is much easier to determine than text type or function, and has the advantage of being determinate and unambiguous, it

Table 1. Number and length of texts in the *Philosophical Transactions of the Royal Society of London* in 1665-67, 1714-16 and 1840

1665-67
Total number of pages 398
Total number of items (including book reviews) 137
Mean length (pages) 2.9

1714-16
Total number of pages 541
Total number of items 56
Mean length: trimodal distribution, see Table 3.2.2

1840 (Part I)
11 items: length 2, 3, 5, 10 / 14, 16, 16 / 26, 31, 34, 59
mean 19 pages
excluding x<10: 26 pages

1840 (Part II)
12 items: length 6, 10,10 / 17, 18, 20 /24, 44, 45, 52, 65, 72
mean 32 pages
excluding x<10: 40 pages

Table 2. Detailed breakdown for 1714-16

1.	4 items	2, *41*, 4, 1
2.	6 items	mean = 6
3.	3 items	3, *20*, *17*
4.	5 items	2, *26*, 6, 5
5.	2 items	3, *52* (Newton/Leibniz debate)
6.	4 items	3, *16*, *18*, 2
7.	7 items	3, *16*, 9, 2, 5, 4, 7
8.	7 items	3, 9, 4, 2, 8, 10, 3
9.	6 items	3, *12*, 2, 3, *15*, 4
10.	5 items	3, 6, 2, 5, *39*
11.	4 items	3, *17+5*, 3, 32
12.	3 items	3, *14*, *19*

would be a great gain if the former could be accepted as a measure of the latter. The question remains whether the correlation is strong enough (and at what times) to allow this.

Analysis of the texts

At this preliminary stage of the work, I examine the texts for three classes of item:

1) Activity-oriented or activity-referring in general, including the writer's own activity. There are two subclasses not at this point examined separately: items referring to the *knowledge structure* of the discipline and to the *text* itself.

2) Interpersonally oriented with specific reference by name.

3) Hedges (both attributive and plausibility); expressed by modal verb, speech-act verb or other means.

The concept of 'item' is at this point not strictly defined: it is a complete functional text-unit of whatever size, usually a phrase or a clause. Ultimately a strict and operational definition will be necessary, if only for statistical analysis.

Text 1: William Bowman: "On the Minute Structure and Movements of Voluntary Muscle" (1840).

Background of text and relevance of biographical data to the study of language change

The text dealt with here consists of the first four paragraphs (roughly 2.5 %) of a forty-page text, published in the *Philosophical Transactions of the Royal Society of London* in 1840. The author, William Bowman, was at the time only 24 years old; he was what today would be called a graduate student, working under Professor Robert Todd. Bowman was considered an extremely promising student; he was elected to the Royal Society soon afterwards, to a great extent on the strength of this paper, and went on to become one of the most prominent men in Victorian physiology.

Biographical information is not normally considered relevant to the study of language change; if, however, we look for the sociolinguistic mechanisms and processes underlying such changes, the age, social background and other demographic characteristics of the speaker are relevant (see eg. Labov 1966). It is possible that the origins of changes in EASP structure should be looked for in

texts by younger writers. Social factors, broadly interpreted, may also be relevant: Bowman, for instance (like many other prominent Victorian scientists), came from a provincial, middle-class and 'Nonconformist' background, and his education was at Nonconformist schools, which may well have been more 'modern' in their approach to language and text-production, and the pragmatic communication models underlying them, than the more traditional and conventional public schools of the time. The question of the use of biographical information in history in general is a controversial one (Shapin and Thackray 1974); its application to the study of language change even more so. I suggest the possibility for what it is worth, as possibly relevant to the study of the development of text structure where the individual writers are known. In the case of the history of LASP, an outstanding source of the necessary information is now available, in the *Dictionary of Scientific Biography*, recently completed at the University of Chicago and covering the entire history of Western science.

Text macrostructure

Once we eliminate the Victorian rhetoric, the text seems astonishingly modern, as an EASP text, both in textual and rhetorical macrostructure and in surface microstructure. It would be interesting to look for instance at such aspects as surface cohesion and text deixis, to see if they deviate from modern structure, but I have not done so here. In pragmatic macrostructure the text (especially the part dealt with here) does not differ from a modern EASP text: the first paragraph constitutes what today would be called 'Acknowledgements' (normally nowadays placed at the end of an article but the beginning (the Preface or Foreword) of a book), the second a brief survey of the field and a particular controversial question in it, providing the motivation of the writer's work, the third defines the purpose of the research (in terms of the schema suggested in above, this is an example of (4) "deciding between competing interpretations or models") and the fourth gives terminological definitions. Note also the typical identification, in the third paragraph, of 'paper' (ie. *text*) and research, the actual work done in the laboratory. The verbs (or rather, verb phrases) used are typical EASP performatives: to *vindicate the correctness of an opinion*, *to render* more exact our knowledge, to *point out* existence and properties, and to *elucidate* the cause. Verbs used in subordinate clauses are *ascertain* and *describe* (used twice, once about the discipline in general and one

about oneself). Of these, the only one probably not available in modern EASP discourse is *render*, and that is presumably a matter of general linguistic change rather than development of EASP. The functional overlap of scientific research and 'publication' is reflected in text structure. If we take this as one of the defining characteristics of EASP, when does it begin? That is one question I hope to answer in future research.

Activity-related items in general

The following items are found:

(7) the first discoveries ... were communicated
(8) it has long been known
(9) (minute threads which ...) have generally been regarded
(10) All the best observers ... have recognised
(11) we seem to be as little advanced ... as ever
(12) The improvements which have taken place in the construction of microscopes appear indeed to have only offered grounds for new differences of opinion
(13) as may be seen by the records of the last few years
(14) A more common opinion is ...
(15) (his claims to it) have often been overlooked
(16) My design in the present paper is to vindicate ... the general correctness of this opinion (2)
(17) to render more exact and ample the knowledge of its details (2)
(18) to point out the existence and properties of new parts which ... have not yet been described (2)
(19) to elucidate the ... by describing shortly ... (2)
(20) it becomes necessary to attach to them a term of definite meaning
(21) (the words ...) have been so much abused by indiscriminate application
(22) it would be confusing the subject to employ them in this sense
(23) the term ... adopted by (Fontana and) some subsequent writers
(24) will be shown in the sequel to be liable to considerable objections
(25) can never be said to be a correct expression
(26) I shall prefer its use
(27) will be styled...

Specific reference by name

(28) since the time of Leeuwenhoek
(29) In 1837 Mr Skey, after an elaborate investigation, concluded
(30) Dr. Mandl, a microscopical observer in Paris, has described and figured them ...
(31) More lately Dr. Schwann and M. Lauth have advocated...
(32) the former, who has adduced...

Hedges and other courtesy and/or face-saving markers

It is in the area of *courtesy markers* that the Victorian EASP text differs perhaps most from a modern one. We would no longer refer to "the illustrious Leeuwenhoek"; nor would a EASP writer, however young and humble, use such expressions as "I am encouraged to hope" or "not altogether uninteresting" about his or her own work. In principle (though not necessarily in practice) all EASP writers are equal members of the scientific community. But face-saving devices are common now as then, especially in the case of disagreement. An interesting one here is the item

(29) Mr Skey, after an elaborate investigation, concluded

The point here is that the writer is disagreeing with Skey and rejecting his conclusion; that is presumably the reason for describing his research as 'elaborate' (one would suppose that the work of others, with whom Bowman agrees, was equally elaborate). The EASP performative *conclude* is used in the same way today; the writer is not committing himself as to the truth value of the conclusion. Note also the use of the imperfect, compared to the perfect of the following sentence:

(30) Dr Mandl ... has described and figured them ...

This is consistent with the point made in above as to the use of tenses to express knowledge-structures in the discipline.

Both plausibility shields and attributive hedges are part of the activity-related items, listed in above: *seem to be, appear indeed to have, have often been overlooked* etc., and the careful attribution of various findings and/or theoretical

conclusions to individual writers. A difference compared to a modern text is that the writer does not consider it necessary to specify the precise source; the text contains some footnotes, but by no means all references are documented. Whether this is because the field was still small enough for the writer to assume that his addressees would know the reference, or because the apparatus for academic, scientific and scholarly documentation was not yet sufficiently developed, remains an open question.

Robert Hooke: *Micrographia* (1665).
(Text taken from facsimile edition, Dover Books, 1961.)

Background of text

Robert Hooke (1635-1703) was one of the founding and most active members of the Royal Society; as 'curator' to the Society, he was responsible for providing "experiments" at the meetings. His *Micrographia* was commissioned by the Society, and was one of the most important European scientific publications of its time. There are of course considerable differences in general and core language structure between the mid-17th century and the present, but it is interesting to examine the text for the occurrence of typical EASP discourse markers, whatever surface form they may have. Here only a brief glance at one page of text is possible; this is not necessarily a representative passage, since it was chosen for its relatively high frequency of these items.

EASP markers: activity-reference and hedging markers

(31) it seems reasonable to think
(32) that shining transient body which we call Flame
(33) flame seems to be a mixture of Air, and the combustible
(34) this may be easily observed (?)
(35) as I have elsewhere shewn is requisite to produce light
(36) This *Hypothesis* I have endeavoured to raise from an Infinite [sic] of Observations and Experiments, the process of which would be much too long to be here inscrted, and will perhaps another time afford matter copious enough for a much larger Discourse
(37) has yet been so little truly examined or explain'd, that a diligent enquirer will be able to find but very little information from what has been (till of late) written about it; But being once well understood, it will, I doubt not,

inable [sic] a man to render an intelligible, nay probable, if not the true reason of all the *Phaenomena* of Fire, which, as it has been found by Writers and Philosophers of all Ages a matter of no small difficulty, as may be sufficiently understood by their strange *Hypotheses*, and unintelligible Solutions of some few *Phaenomena* in it

(38) as I shall elsewhere endeavour to manifest when I come to shew the use of ...

(39) In this place I have only time to hint a *Hypothesis*, which, if God permit me life and opportunity, I may elsewhere prosecute, improve and publish.

(40) by the eminently Ingenious and Learned Physician, Doctor Ent, who receiv'd it for a Present from the famous *Ingenioso Cavalliero de Pozzi*

We see here, either in embryonic form or fully developed, many of the features of modern EASP discourse. A full analysis, however, would involve comparison to texts on similar subjects written prior to the beginning of modern science, ie. approximately up to the end of the 16th century. Hooke's text does of course contain such usage as well; an example in this passage is probably the phrase contained in (36), 'writers and philosophers of all ages'.

(39) and (40) are interesting. The phrase "if God permit me life and oportunity" (39) would no longer occur as such in modern EASP, but in terms of discourse function it can perhaps be interpreted as a simple personal hedge, attached to the offering of an opening turn (the offering of openings to be taken up by the writer him/herself is very common in EASP). The use of *may* in the same sentence and in (34) (Bowman uses it similarly in (13)) is problematic: should it be interpreted as a modal used as a hedge or as a simple expression of possibility? Note that the EASP performative verbs differ in part both from modern ones and from those of 1840: *show* (several times), *raise* (a hypothesis), *examine, explain, render* (a reason), *manifest* (in the sense of show), *hint* (= modern 'suggest'; also used by Bowman), *prosecute, improve, publish*. In discourse function, however, they are similar. The EASP system of performatives as well as other discourse markers should perhaps be analyzed for each period separately, and the systems then compared; this would reveal the relative balance of certainty, probability and possibility at a given time.

Conclusions and summary

The paper describes a practical model for the analysis of EASP texts in terms of certain sociopragmatic and pragmalinguistic features. The model was then

applied to two early EASP texts, one from the very beginning of modern scientific discourse (1665), showing the occurrence of these features either as such or in embryonic form, and one from 1840, when in some fields at least the concept of the scientific discipline as a discourse community was already established. This text displays the same features in more or less the same form as today; allowing for core-linguistic change, EASP discourse seems surprisingly stabilized at this date, except for the somewhat stronger markers for courtesy. This is probably a general change in rhetorical usage in English, rather than a change in EASP usage in particular.

No statistical analyses were carried out at this point; they would probably show an increase in the frequency of EASP markers in the text. This increase may show a steady (linear) form, or it may show discontinuous 'leaps' at those times when a discipline suddenly becomes more firmly established as a 'science'. Any meaningful statistical analysis, however, would depend on an operational and unambiguous definition of the text *unit* (phrase, clause, sentence or macrotheme); for this purpose, considerable further work is needed.

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